09/830299
JC03 Rec'd PCT/PTO 25 APR 2001

Translation of PCT/EP99/08078 as filed on October 26, 1999

Interactive Film Reproduction

INSAI>

There have been various suggestions for providing users with interactive film or program replay. It has been proposed e.g. to provide a film with a happy or sad ending and to allow the viewers in the cinema to decide by majority which content the film is to have such that all cinema visitors see either the happy or sad ending.

It is moreover known to record an event, e.g. a car race, using many different cameras, e.g. cameras outside of the track and cameras which are disposed in the cockpits of the respective race drivers. The respective camera images are transferred simultaneously to the TV receivers - e.g. the digital TV DF1 - and the viewer can select, from a plurality of possible camera settings, the one which he/she prefers at the moment, e.g. the camera in the cockpit of Michael Schumacher.

Finally, it has been proposed that the platform in a 3D cinema on which the viewer stands or sits, is movable with the motion being controlled by the replayed film content.

The "Zentrum für Kunst und Medientechnologie Karlsruhe (ZKM)" has furthermore proposed, in an inflatable hemisphere in

which a 3D projection system is installed, displacement of the projected image to any position on the inside of the hemisphere. The position of the image is thereby linked to the head movement of a visitor and follows his/her viewing direction. In contrast to e.g. cinema or TV with which image reproduction is always limited to a certain individual location, namely, a section of the cinema screen or TV screen, the above mentioned method of 3D projection displaces an image within the hemisphere to a location which the observer currently views.

It is moreover known to use the above-described 3D projection system within a hemisphere for virtual travel through a reconstructed landscape. Through selecting (clicking on) certain image units, the viewer himself can determine his/her own "walk", while he/she does not actually move and always remains at the same location.

It is the purpose of the present invention to provide an interactive film perception which is inexpensive, attractive and which preferably permits the viewer to simultaneously be director and camera man during replay of the film.

SUBA2> The object in accordance with the invention is achieved by a method in accordance with claim 1. Advantageous further developments are described in the dependent claims.

INSA3> The invention is based on the following considerations: A person lives in a three-dimensional environment and, in

reality, always senses (at least partly) even those things which are outside of his field of vision or which he/she can sense less sharply. A simple example is the driver of a car who drives on a road with his eyes directed forward. If a following driver sounds the horn, the preceding driver will hear that sound. He/she thereby senses what is behind him/her and outside of his/her field of vision and will immediately look (into the rear mirror) to see what is going on behind him/her to draw the associated conclusions. Just as a look into the rear view mirror shows only a small window of what is going on behind the driver without the driver being able to recognize what is happening outside of the mirrored surface, a preferred embodiment of the invention provides that only a film section - also called a window - of the entire film is visible while all other parts of the film outside of the window are not replayed or are darkened and are therefore not or only barely visible. The movement of the window permits the viewer to see all parts of the film, however, not at the same time. The "viewing window", i.e. the visible film section has e.g. a length-side-ratio of 4 to 3, 16 to 9, or any other shape.

In the cinema and on TV and in all known replay forms of moving images, the viewer is always presented with only a narrow camera section (irrespective of whether the camera is stationary or movable), wherein the camera section has a regular width such that it can largely be detected by the field of vision and thus the reception capacity of a person. In contrast to the three-dimensional perception of a person

in his/her surroundings, the usual film and TV replay is directed to one single dimension. Even if the user can select different camera positions, this only results in multiplication of one dimension without providing a three-dimensional sensation which is close to reality.

Finally, the invention is based on the finding that visual perception depends largely on orientation and, vice versa, that the visual sense also influences sensing of acoustical information.

In a movie, the offered images are usually matched to sounds also describing the image, with the exception of background sound, e.g. film music, to influence the mood of the film. If there is a noise in a film which is not matched to the image content shown, the camera will usually move immediately after that sound to the possible source of the sound such that the viewer gains a visual explanation for the preceding sound.

In the above-mentioned film replays, the viewer is largely bound to the camera work and does not know what is happening outside of the section recorded by the camera.

The invention describes a new interactive form of film replay and sensation wherein the viewer and perceiver is offered an image which is larger than his/her field of vision. Although the field of vision of a person is theoretically 180°, actual perception is, however, limited to a field of vision which is considerably less than the theoretical, e.g. 70°. Since a

person can move his/her body and head to direct his/her field of vision towards any point of the surroundings, no handicap results rather advantages, since the human brain must only process that visual information present in the central vision field.

The invention furthermore provides that the viewer is coupled to an orientation unit which detects the viewing direction of the observer. If the viewer watches an individual scene of a film consisting of panoramic scenes, the audio and/or visual reproduction of this scene is emphasized compared to the other scenes. Such emphasis may e.g. be realized by replaying acoustical information from the viewed scene in a louder or clearer manner than from the other scenes which are not currently being viewed or which are not visibly replayed. One individual scene can also be emphasized by enlarged replay of the viewed scene compared to the other scenes or with e.g. higher resolution and sharpness of the viewed scene compared to the other scenes not currently observed by the viewer. In particular, the audio information from the scenes outside of the viewing direction of the viewer is not completely suppressed but can be perceived more or less clearly by the viewer.

The invention permits a sensing of the film which is close to reality. An additional particular advantage of the invention is the creation of a completely new type of cinema, wherein the user, at first viewing, can only see parts of the entire film and two viewers could have completely different opinions

about the film, since they have seen and heard completely different portions of the entire film.

In a particularly preferred fashion, the invention can be perceived in a 3D projection system of a hemisphere or full sphere. The image recorded from only one camera location can be replayed onto the inner surface of the hemisphere using a 3D projection system. If a corresponding section from the surroundings has been recorded with the camera - i.e. not only the usual narrow camera section but all views which can be detected from the camera location - the viewer is simultaneously offered many more scenes, in one single image, than he can theoretically (visibly) see, since the field of vision of the observer is considerably smaller than the overall replay surface. This observer burden is further increased by simultaneously replaying several different scenes, wherein the viewer is usually accustomed to concentrating on only one scene and cannot completely detect and digest the other scenes. When the viewer looks at a certain scene, the replay device is informed thereof by the viewing direction orientation unit and the audio information which belongs to that currently viewed scene can be sensed and is cognizant to the viewer. At the same time, the audio information of other scenes is not completely faded out but somewhat suppressed (as in real perception) such that the observer still notices that something else is going on somewhere else in the film, but is not completely cognizant of the film scene not viewed.

INSA4>

In addition to known sound reproduction devices, such as headphones and loudspeakers, sound reproduction devices are also suitable for an acoustical perception close to reality as are known e.g. from WO97/41709. This sound reproduction device is particularly preferred since sound perception includes the body sound functions and, in contrast to a loudspeaker system, several users can have different sound perception in one room at the same time and without mutual disturbance should e.g. neighboring viewers look at different film scenes. Further advantages of the invention can be extracted from the following exemplary description of the figures:

Fig. 1 shows a view of a scene example;

Fig. 2 shows a planar representation of scene 1;

Fig. 3 shows a scene representation alternative to that of Fig. 1;

Fig. 4 shows a cross-section through an inventive cinema;

Fig. 5 shows a view of a replay of an inventive film;

Fig. 6 shows a view from above of an inventive cinema arrangement.

INSA5>

Fig. 1 is a top view of a constructed panoramic film scenery 1, wherein the entire scene is composed of several scene

sections. The first scene section 2 is a road on which a car is travelling. The second scene section 3 is a small group of trees (park-like grounds) with a dog walking and barking. The third scene section 4 is a small pond with quacking ducks looking for food. The fourth scene section 5 is a playground with several loudly playing children. The entire scenery is illuminated by the sun at location 6. All scene sections have exactly the same light conditions and the same sun light impinging angle. All film scenes are recorded in total by a camera 7 at the camera location 8. The camera device 7 records the entire film scenery, i.e. a maximum of a 360°, round view. In addition to the optical recording, the respective sounds which belong to a scene are recorded, with the recording being carried out such that an optical scene is associated with the associated sound during recording.

Fig. 2 shows the replay of the scene shown in Fig. 1 in planar elevation between 0 and 360° (in the horizontal and vertical direction). Shown, from the left part of the replay to the right edge of the replay screen, are the car scene 1, then the tree scene 2, then the pond scene 4 and then the playground scene 5. The planar replay shows a section G which characterizes the area which is usually visible to the human eye (field of vision). It is to be understood that this section G always moves with the eyes of the viewer. If the viewer looks at the car scene, he/she will clearly hear the sound of the passing car, and may also simultaneously hear sounds from other scenes. The sounds from the other scenes are replayed with a lower volume and less clarity to allow

the viewer to experience the film in a manner which is as close as possible to real perception. A person standing at location 8 of the camera 7, and looking at the road, would also hear the sound of the other scene sections without being able to perceive them with full optical clarity. This experience is also possible with the inventive replay shown in Fig. 2.

Fig. 4 shows a cross-section of a view onto a closed circular surface of a hemisphere constituting the cinema screen. The viewer is in the center of the cinema and directs his/her eyes towards the film scene 2 - a road with a passing car. The viewer wears headphones or a sound reproduction device which can be disposed on the head of the viewer, as disclosed e.g. in WO97/41709. Moreover, a signal transmitter, e.g. a magnetic field generator or a device for generating an electromagnetic wave (e.g. an (infrared) light/laser source) is disposed on the headphones, on the sound reproducing device, or at another location on the viewer's head. A uniquely directed signal 23 is transmitted by the signal transmitter, e.g. an oriented magnetic field or an oriented light beam, wherein the direction of the signal corresponds to the head orientation/viewing direction of the cinema visitor (viewer). This can be achieved by disposing the signal emitter (mounting) on the head of the user or on the headphones in an unambiguous fashion.

A signal receiving device 24 is also provided which can detect the signal 3 or the direction of the signal. If the

signal transmitter is a magnetic field generator, the receiving device can determine the direction of the magnetic field of the magnetic field generator. If the signal transmitter is an infrared laser light source, the receiving device may be a corresponding camera device by means of which the direction of the laser light source can be received (infrared is invisible to humans). The receiving device can also be movable, or be stationarily disposed in the cinema such that it is not visible to the viewer.

The direction of the signal (e.g. 10°) from the signal transmitter is determined by the receiving device 24 and, depending on the result, the replay is influenced in the above-described fashion such that e.g. noises which belong to the car scene 2 viewed are reproduced at a higher volume than noises from other scenes not currently observed by the viewer.

In addition to the direction of the transmitted signal from the signal transmitter, the receiving device may also determine the exact location of viewing. If the viewing location is not in the foreground of the film scene but rather in the background, the background will also be given sharp contrast and/or be enlarged (PAN/-Zoom) as much as possible such that the viewer can perceive not only a two-dimensional but a real three-dimensional image.

If the car scene shows e.g. a mother walking with her child on the pavement behind the road (Fig. 1), and the viewer

directs his/her view onto this lower section of the scene, he/she will perceive what the mother says to her child or can recognize the person and her clothes as exactly and sharply as possible.

Fig. 3 shows a view of scene other than that of Fig. 1. The scene shown in Fig. 3 is a restaurant with many tables, a restaurant entrance, a counter (bar), a cabaret stage and a bordering kitchen. The camera location is again characterized with position 8 and the camera 7 records the entire surrounding scene. A couple is seated at table T1, three friends sit around table T2, a member of the board of a company sits at table T3, four bowling companions sit at table T4, a family with a child sits at table T5, at table T6 is a group from regulars of a students association, an attorney and his clients sit at table T7, at table T8 is a children's birthday party, at table T9 are three criminals planning a bank robbery and the last table T10 is occupied by a group of politicians. The bartender at the counter prepares the ordered drinks and individual persons leave or enter the room through the entrance, from which street noises can be heard. The table arrangement suggests that every individual table has different topics for discussion. If, after several minutes of this recording, there is an explosion in the kitchen, all people in the restaurant will look in the direction of the kitchen, and each individual could perceive or interpret the explosion differently. The camera simultaneously detects all conversations and reactions at all tables and one can imagine that this panoramic film recorded

by the camera must be replayed several times to see all scenes and to digest their content.

When recording the film scene, the respective optical impressions of an individual table are associated with the respective acoustical information of that table such that, during replay, a corresponding amplification of the audio information is possible through replay of other acoustical information from other tables. All optical or acoustical information can also be initially associated with directional information (e.g. in degrees) to audio-visually emphasize one scene section compared to other scene sections during replay.

Since every single table effectively represents an individual film, the viewer may have to see the same film at least ten times in order to experience the entire film, while concentrating on different tables each time. It is thereby particularly interesting to watch the different reactions to the explosion in the kitchen at the various tables, which permits interesting character studies.

Fig. 5 shows a planar view of a screen with a visible section of the film shown as rectangular window. A light spot in the center of the window comes from a laser (laser pointer) which is mounted to the head of the user such that the direction of the laser approximately coincides with the viewing direction. The visible film section SA (SA_H, SA_V) is generated by a projector and a camera is mechanically and/or electronically coupled to the projector to detect the light spot. If the

viewer changes the viewing angle, the position of the light spot also changes. The camera follows the light spot and causes, through control of the projector, the visible section window of the film to be displaced in the direction of the light spot until the light spot is preferably once more within the visible film section. Displacement of the section also changes the film content which always depends on that content which is to be replayed at the current sectional position.

In general, there are several ways in which the visible section (the visible window) of the film can be moved. The film projection device can e.g. track until the light spot is centrally located in the window or within a certain central region of the window (to avoid constant movement of the window). It is also possible to displace the window until it has approached a certain separation from the light spot. It may furthermore be advantageous to prevent window movement if the light spot is outside of the camera section KA. Alternatively, the window can move in the direction in which the light spot has left the camera section KA.

Advantageously, the camera section KA, i.e. the horizontal and vertical camera section KA_H and KA_V, is larger than the window section such that the camera can follow the light spot even when it is already outside of the window section SA.

Fig. 6 shows a cinema arrangement from above, wherein the cinema screen has a cross section of a full or partial circle

40. A projector 41 is located at a central position in the cinema and projects the sectional window 42 of the movie which is to be viewed onto the screen 40. The width of the visible film section (window width) is characterized by SA_H. Moreover, there is a camera 43 above or below the projector or at another location in the cinema which records a relatively large camera section KA_V, wherein the visible film section lies within the camera section. If the film viewer, who carries an optical signal transmitter (see description of figure 4), looks at the observed film section 42, a light spot 44 will appear in the center of the film section. This light spot is detected by the camera 43 and the camera 43 tries to substantially follow all movements of the light spot. The camera 43 controls the projector 41, disposed on the movable platform, such that when the light spot is displaced, the visible film section is also displaced and the film content simultaneously changes. The viewer is thus both camera man and film director.